SAMSUNG
Electron Devices

MONOCHROME MONITOR

SERVICE MANUAL

SM-12SFA7

'Samtron' is a Brand of Samsung

Samsung European Spares
01952 207171

Authorised Service Centres

Pre 1995
Hulcote Electronics
01234 344206

1995-To date (as of Aug 96)
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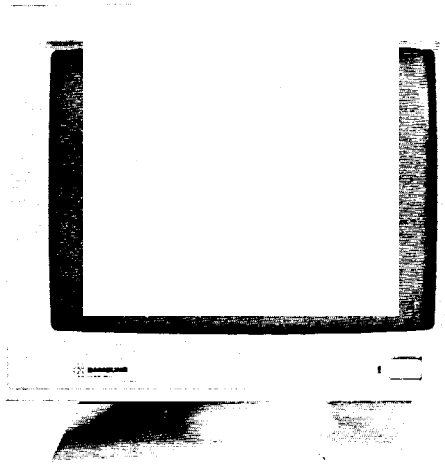
01952 676140 (No. Will change)



SPECIFICATIONS

Power source	AC 115V±15%, 60Hz
	AC 220V −240V ± 10%, 50Hz
Power consumption	35 Watts
Input connector	9 Pin D-subminiature connector
Video signal input	3.4V ± 1.0V Positive
Dual intensity	3.4V ± 1.0V (high intensity), positive
Horizontal sync	TTL level positive
Vertical sync	TTL level negative
Picture tube	12" diagonal, 90° deflection
	12HBY*N, Phosphor P 39, PLA, PWD Available
Scanning frequency	Horizontal −18.43KHz
	Vertical −50Hz
Active video period	Horizontal −44.3us
	Vertical −18.89ms
Resolution	Horizontal −720 dots
	Vertical −350 lines
Active display area	210(H)×160(V)mm
Display Charactor	80 characters with 25 lines (7×9 dots)
Dimensions	380(H) × 363(V) × 365(D) mm
Weight	9.6Kg Approx.

※ NOTE : Specification are subject to change without notice

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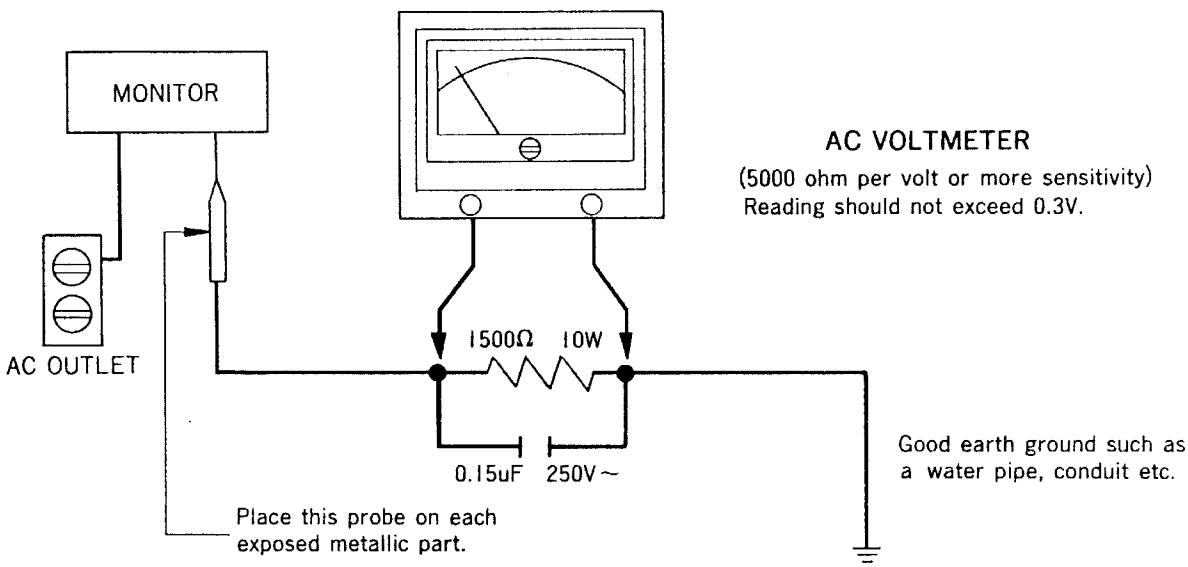
SAFETY PRECAUTION

WARNING : Service should not be attempted anyone unfamiliar with the necessary on this unit. The following precautions are necessary during servicing.

1. Some parts such as a picture tube in the unit have special safety-related characteristics for X-RAY RADIATION protection. For continued safety, the parts replacement should be undertaken referring to item 2 below.
2. Many electrical and mechanical in this unit have special safety-related characteristics for protection against shock hazard, fire hazard and others.
   These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage etc.
   Replacement parts which have these special satety characteristics are identified in this manual and its supplements by shading on the schematic diagram and the parts list.
   Before replacing any of these components, read the parts list in the manual carefully.
3. When replacing a chassis in the cabinet, always be certain that all the protective devices are installed properly, such as insulating covers, barriers, strain relief, etc.
4. Before replacing the back cover of the set, thoroughly inspect inside the cabinet to see that no stray parts or tools have been left inside.
5. Before returning to the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as terminal, screwheads, metal overlays, control shafts, etc.
   To be sure the set is safe to operate without danger of electrical shock. Plug the ac line cord directly in to a 220V AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner.
   Connect a 1500 ohm, 10 watt resistor, paralleled by a 0.15mfd (μF), 250V AC capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time.
   Measure the AC voltage across the combination of 1500 ohm resistor and 0.15mfd (μF) capacitor.
   Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exposed metallic part.
   Voltage measured must not exceed 0.3 volts RMS.
   This corresponds to 0.2mA AC any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



Voltmeter Hook-up for Leakage Current Check

GENERAL INFORMATION

1. MONITOR DESCRIPTION

This 12" FLAT SCREEN CRT display monitor is operated in TTL drive mode input.

2. OPERATING CONTROLS

1) External controls
   - Front
     Power switch, LED.
   - Rear
     9 Pin D-sub connector, Inlet socket for AC power input,
     V-hold, Height (V-size), Brightness, contrast.

2) Service controls (Internal controls)
   V-linearity, H-width, H-linearity, Focus.

3. DISPLAY MONITOR ELECTRICAL CHARACTER

1) AC Power Input : 115V±15%
   Power consumption is 35W under normal viewing condition and uses internal fuse protection.

2) Video
   Input : 3.4±1.0V TTL positive
   Band Width : 18MHz(-3dB)

3) Horizontal Electrics
   Hold Range : 17.5KHz-18.9KHz
   Adjustment range
   Retrace Time : 9.96us (Includes retrace and delay time)

4) Vertical Electrics
   Hold Range : 47Hz to 63Hz
   Retrace Time : 1.058ms min(Includes retrace and delay time)

5) Adjustment size range : 215×150 (mm)
   (Horizontal, vertical from 5% over scan to 5% under scan)

4. MECHANICAL SPECIFICATION

Figure-1 shows the mechanical specification for the CRT display monitor.

5. CRT DISPLAY CHARACTERISTICS

1) Cathode Ray Tube Specification
   - Size : 12" diagonal
   - Deflection Angle : 90°
   - Glass Area : 74 Square inches
   - Implosion Protection : Shrinkage band with mounting lug.
   - Phosphor : P 39, PLA, PWD available
   - Display size : 233(H)×180(V) (mm)
   - Face : Direct etched
   - Anode Voltage : 13.0±1KV

2) Picture Quality
   - Resolution : 1100TV line at center, 900TV line at corner at 5 foot-lambert with full "E" character.
   - Geometric Distortion : The perimeter of display pattern approaches and ideal rectangle to within ±1.5% of the rectangle height.
   - Linearity : Character height or width shall be within 10% of that for any adjacent character and within 20% of that for any character on the screen.
   - Display Capability : 80 Characters/Row, 25 Rows.

6. ENVIRONMENTAL SPECIFICATION

The monitor is capable of meeting all performance requirement and operate continously and reliably during and after exposure to any or all of the following environments.

1) Temperature
   - Operating : +5°C to+40°C
   - Storage : −35°C to +50°C

2) Humidity : 5 to 90 percent (non condensing)

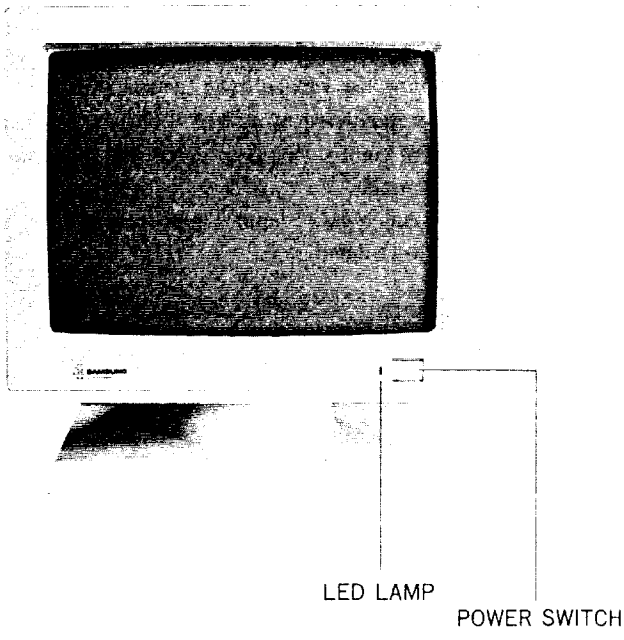
3) Altitude
   - Operating : Up to 10,000 FT
   - Non Operating : Up to 50,000 FT

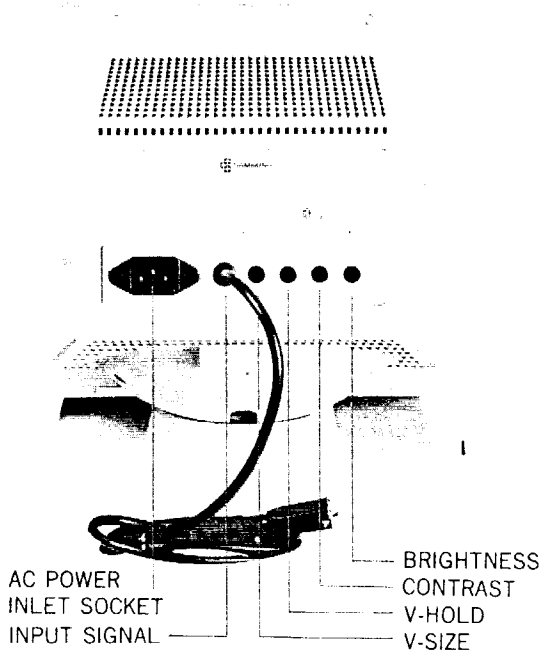
7. X-RADIATION

The CRT display monitor complies with the federal regulation for rediation control as required by the radiation control for health and safety act of 1986 and as implemented by title 21 subchapter J of the code of federal regulation.

1) Weight : Approx 9.6kg
2) Others : All components are capable of meeting UL, CSA, FCC, DHHS, requirement.

CONTROLS AND TERMINAL IDENTIFICATION

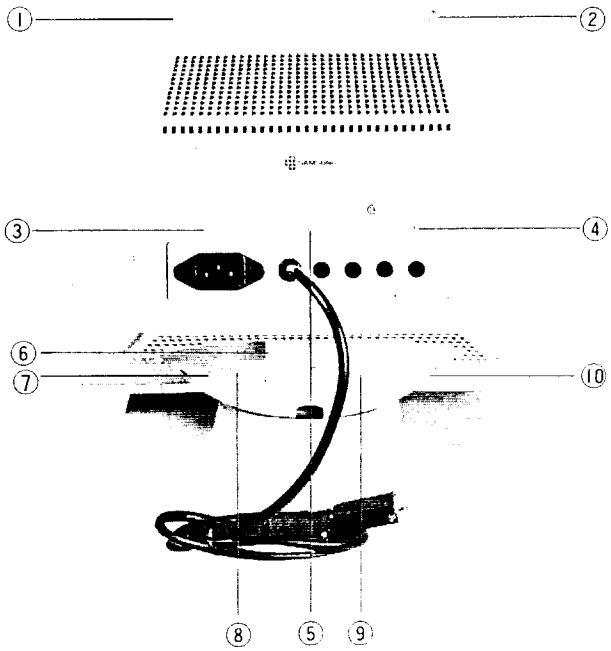




MECHANICAL DISASSEMBLIES

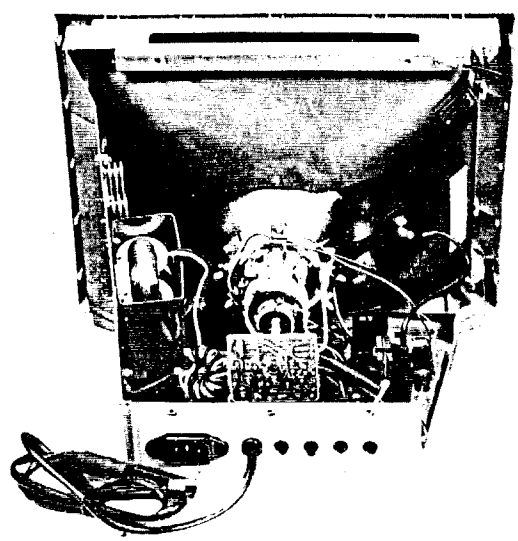
CABINET BACK REMOVAL

1. Carefully lay cabinet face down on soft mat.
2. Remove ten(①-⑩) screws securing the cabinet back and bottom.



CHASSIS REMOVAL

1. First remove cabinet back.
2. Disconnect anode cap, picture tube socket and wire bands. Then slightly loosen the screw securing the deflection yoke.



IMPORTANT NOTICE FOR SERVICE PERSONNEL BEFORE SERVICING

PLEASE READ BEFORE ATTEMPTING SERVICE

1. Line voltage must be kept within ±15% of the rated voltage.
2. DO NOT DISCHARGE, ARC, OR MEASURE HIGH VOLTAGE WHEN HIGH VOLTAGE LEAD IS CONNECTED TO CRT. DISCHARGE 2ND ANODE OF CRT ONLY AFTER HIGH VOLTAGE LEAD HAS BEEN DISCONNECTED. DO NOT DISCHARGE HIGH VOLTAGE LEAD AT ANY TIME, DAMAGE TO TRANSISTORS MAY RESULT.
3. While the monitor is in operation, do not attempt to connect or disconnect any wires.
4. Disconnect all power before attempting any repairs.
5. When the power is on, do not attempt to short any portion of the circuit.
   This shorting may cause damage to the transistors in the monitor.

ADJUSTMENT

Apply power and TTL input signal(alphanumeric information) to the data dislpay.

CENTERING

1. Loosen the Deflection Yoke clamp and carefully move the yoke on the neck of the picture tube as far forward as possible.
   Rotate the yoke until the top bottom edges of the raster are straight. Tighten the clamp.
2. Center the raster by rotating the centering ring magnets.

FOCUS

Adjust focus control VR502 for providing the best focus.

HORIZONTAL WIDTH

1. Horizontal width coil to obtain the optimum width for full information.
   If the recommended input signal format is used, the width should be (210mm).
2. When character width variation is observed in character of one row. turn the core of the horizontal linearity control until the character width is uniform.

VERTICAL HEIGHT AND LINEARITY

1. Synchronize the vertical frequency to the information signal by adjusting the vertical hold control VR302.
2. Adjust vertical linearity control VR301 for the best linearity and height control VR303 to obtain the optimum height for full information.
   (If the recommended input signal format used, the height should be (160mm).

SERVICE INFORMATION

ADJUSTMENTS

▼ BRIGHTNESS

Normally, the monitor will be used to display alphanumeric or other black and white information moreover, the video polarity is usually white characters on a black background. The brightness control should be adjusted at a point where the while raster is just extinguished the CRT with then be at its cut off point, and a maximum contrast ratio can be obtained when a video signal is applied fully.

▼ VERTICAL ADJUSTMENTS

There is a slight interaction among the vertical frequency height and linearity controls. A change in the height of the picture may affect linearity.

1) Set the vertical-hold control VR302, near the mechanical center of its rotation.
2) Adjust the vertical linearity control VR301 for best vertical linearity.
3) Adjust the vertical height control VR303 for desired height.
4) Readjust the vertical hold control VR302 until the picture "locks" on vertical sync.
5) Recheck height and linearity, and readjust, if necessary.
6) Slight readjustment of vertical hold contol, VR302 may be required if the picture "Rolls" up or down after a power off/on sequence.

▼ HORIZONTAL ADJUSTMENTS

Raster width is affected by a combination of the DC power supply, horizontal width coil and the horizontal linearity coil.

1) Horizontal Linearity
   When character width variation is observed in characters of one row, turn the core of adjustor so that character width should become uniform.
2) Horizontal Width
   Adjust horizontal width by turning the core of with a plastic hexdrive for the desired width.
3) Readjust horizontal linearity and width coil for proper width.
4) Observe final horizontal linearity and width, and touch up either adjustment if needed the raster should be properly locked and centered when the horizontal drive signal adjustment (Described in steps 1-4 above) have been completed.

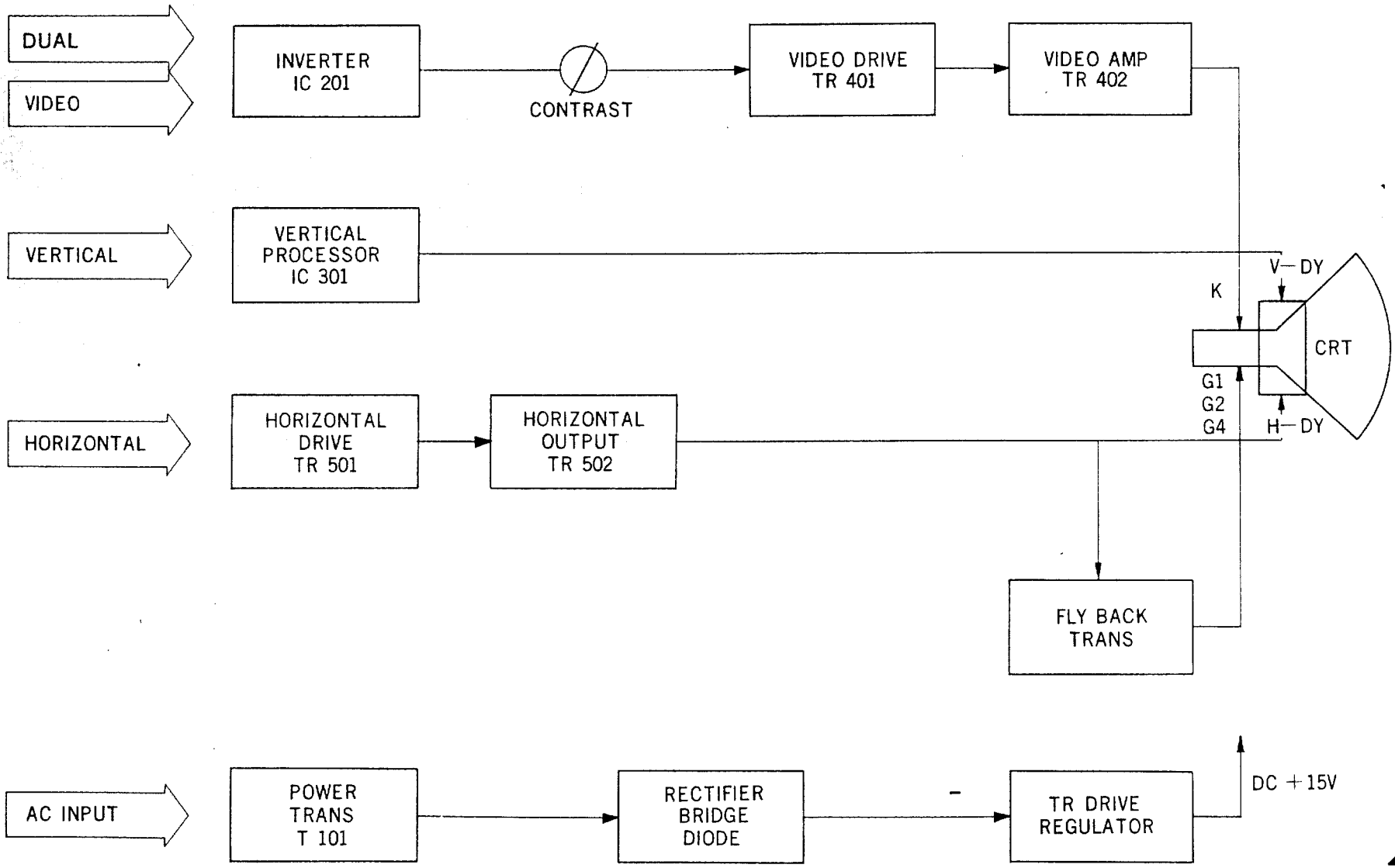
▼ DEFLECTION YOKE ASSEMBLY ADJUSTMENTS

1) Raster Centering
   If the raster is not properly centered, it may be repositioned by rotating the ring magnets behind the deflection yoke.
   The ring magnets should not be used to offset the raster from its nominal center position because it would degrade the resolution of the display if the picture is tilted, rotate the entire yoke.
2) Geometric Corrections
   The magnets on the yoke assembly shall be polarized so as to provide adjustment of pin-cushion, barreling and other geometric deformitics by simply rotating the magnets until the desired display is achieved readjust if necessary.

▼ FOCUS ADJUSTMENTS

Although the focus control, VR502 dose not have a large effect on focus because of the CRT gun-assembly construction.
So there is a dynamic focus which does not control.
If provides some adjustment for maintaining the best overall display focus.

BLOCK DIAGRAM



THEORY OF OPERATION (CIRCUIT DESCRIPTION)

▼ VIDEO AMP AND OUTPUT

This circuit consist of video amplifier and dual.
Video signal which applied to pin 11 of IC201 is developed by pin 9 and pin 10, it is common, and drived signal is applied to pin 8 of IC201.
This signal is drived via contrast volume, and connected TR401, TR402.
TR401 and TR402 are connected in cascode configuration.
Finally, drived signal is applied to CRT cathode through output amplifier.
Dual signal which applied to pin 1 of IC201 is developed by pin 2 and pin3, it is common, so drived signal is applied to pin 4 of IC201.
When the level of digital signal is low (0), D203 is conducted, and controlled the voltage of contrast volume, variable resistor, is drived via D202 and applied pin 8 of IC201 then contrast volume is controlled.
If the level is high (1), D203 is not conducted, so Vcc is drived via D202 and applied pin 8 of IC201.
TR402 operates as common emitter configuration and TR401 operates in the common base configuration. This minimizes "THE MILLER EFFECT" input capacitance and defining breakdown parameter for TR402 becomes BVcbo as opposed to BVCEO for the common emitter configuration.

▼ VERTICAL PROCESS CIRCUIT

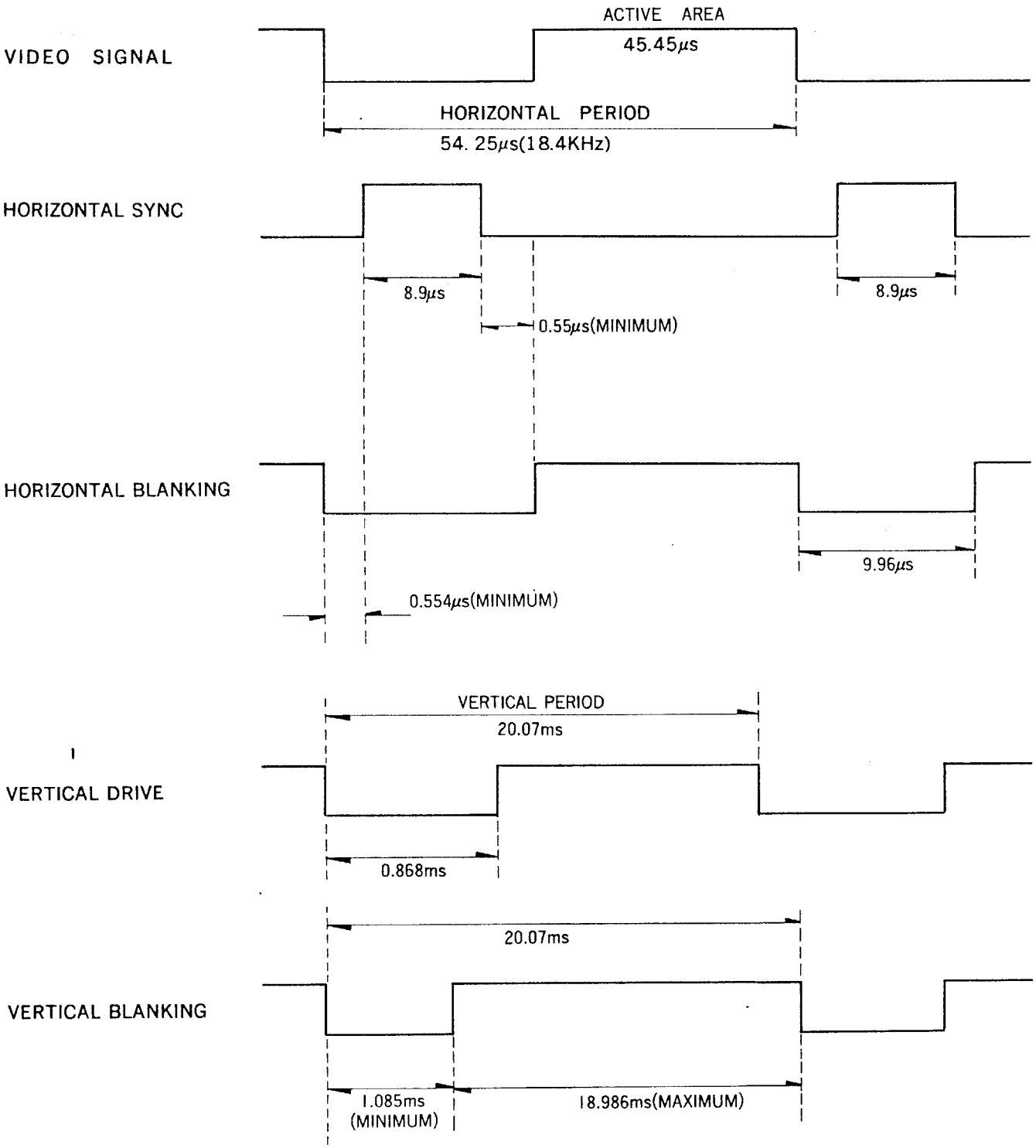
Vertical deflection circuit consist of one stage, IC301 which accomplishes all active vertical sync functions.
Vertical input pulses are differentiated by C301 and R301.
The sync input performs several function. It strips away any random noise that may be present on the input line and conditions the vertical pulses for processing.
It also converts the input voltage pulses to current control the internal oscillator.
The Oscillator generates non-symmetrical square wave with a short duty cycle at approximately 50Hz. Components VR302, and R306 and C304, determine the frequency. This square wave signal is applied to a ramp generator whose slope and amplitude is determined by VR303, and R305.
The ramp voltage signal is applied to a buffer stages which isolates the ramp generator from the output stages and reduces any loding on the previous stages. Components R311, R309, VR301, C307, C308, reshape the ramp voltage to make it extremely linear.
The output signal from the buffer stage is applied to a pre-amp stage. For amplification and then to a power ramp stage which drived the vertical deflection coils display via coupling capacitor C301, C309, R311, R308, R312, R315, R310 and C302 AC and DC feedback for the output stage to maintain proper gain and linearity.

▼ HORIZONTAL OUTPUT AND FLY BACK TRANSPORMER

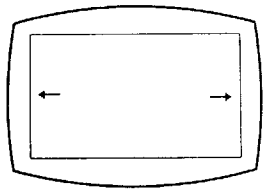
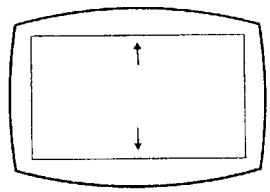
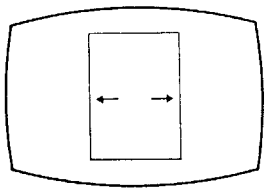
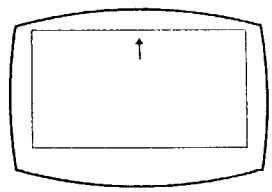
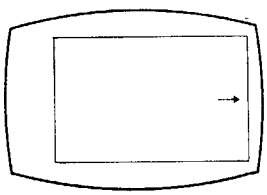
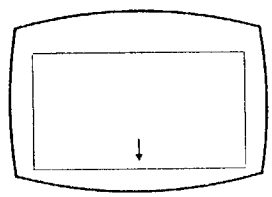
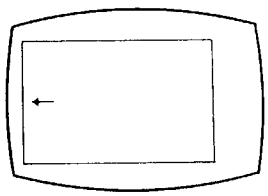
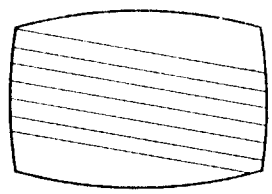
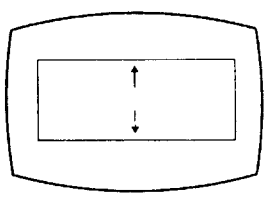
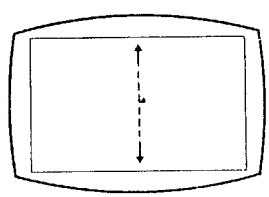
The horizontal output transistor TR502 is simply a switch is turned on and off at the horizontal scan rate by the driving signal applied to its base.
A saw tooth current through the deflection coil is required to sweep the beam lineary across the CRT screen. This happens when TR502 is turned on and its collector voltage drops to near zero.
And then C506 begins discharging the deflection yoke coil which deflect the beam to the right edge of the CRT.
At that time TR502 cuts off and C506 causes to supply current to the deflection coil. However an induced voltage appear across the deflection yoke coil as the magnetic field collapses and an oscillation then occurs the deflection coils and C506.
During the first half cycle of this oscillation the induced voltage is felt across the collector of now cut TR502, C506 and the primary of T501. (F.B.T.)
This voltage is stepped up by T501 and rectified to produce high voltage that is applied to the 2nd anode at the CRT.
During the second half cycle of the deflection coil C506 oscillation, the voltage on the collector still cut off TR502 becomes negative
At this time damper diode D504 becomes forward bias and begins conduction.
The DC operating voltage for the CRT with the exception of the heater voltage are all obtained by rectifing and filtering of the horizontal flyback pulse.
D507 and C516 rectify and filter the flyback pulse across TR502 to produce a G2 voltage.
This voltage also feeds to the flyback pulses that rectified and filtered by D505 and C511 to produce voltage which is used as the source voltage for GI control raster brightness.
Also, the CRT anode voltage is developed by T501.
This voltage is typically 13.0KV for 12" normal size.

VIDEO INPUT SIGNAL

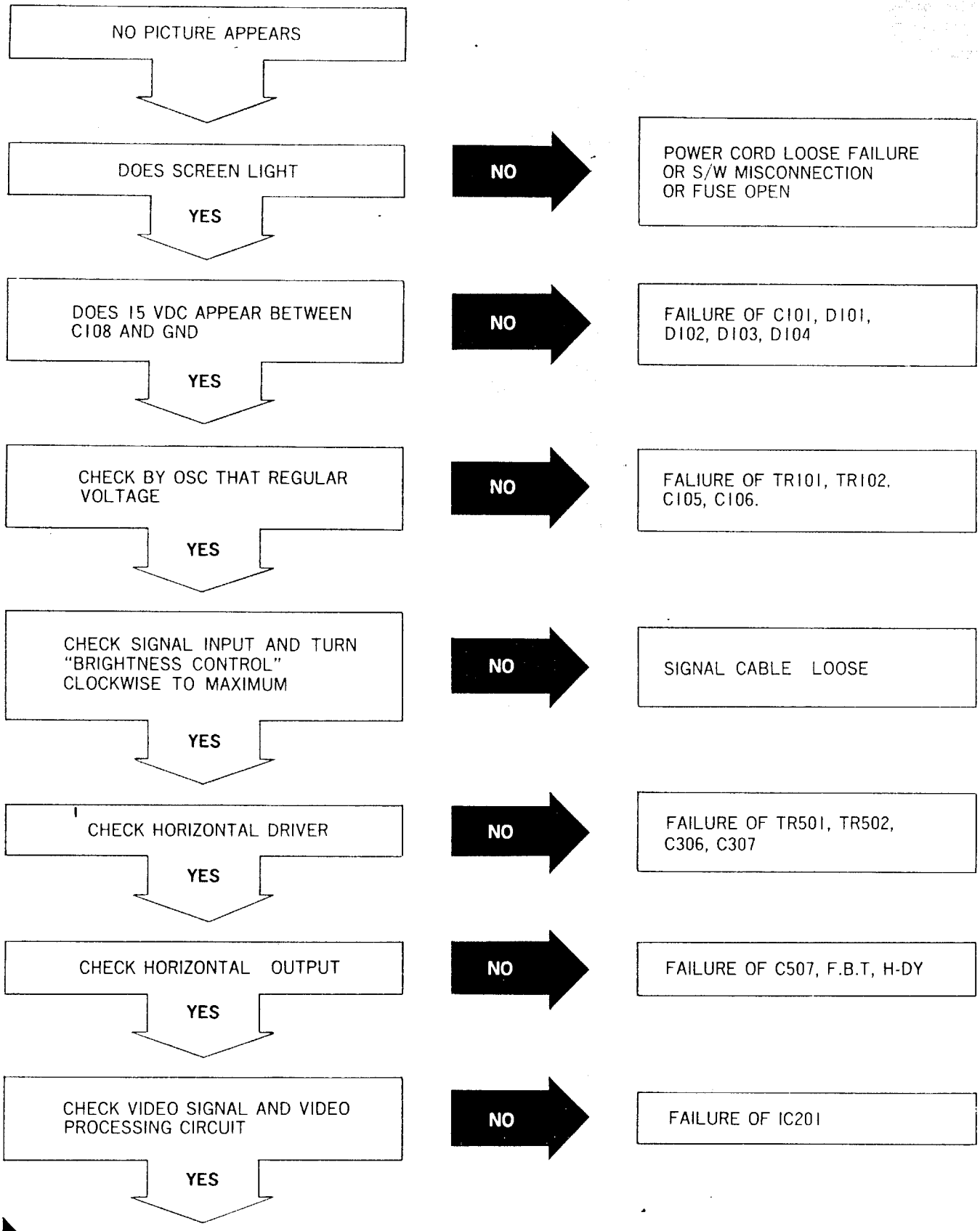
SIGNAL TIMING CHART

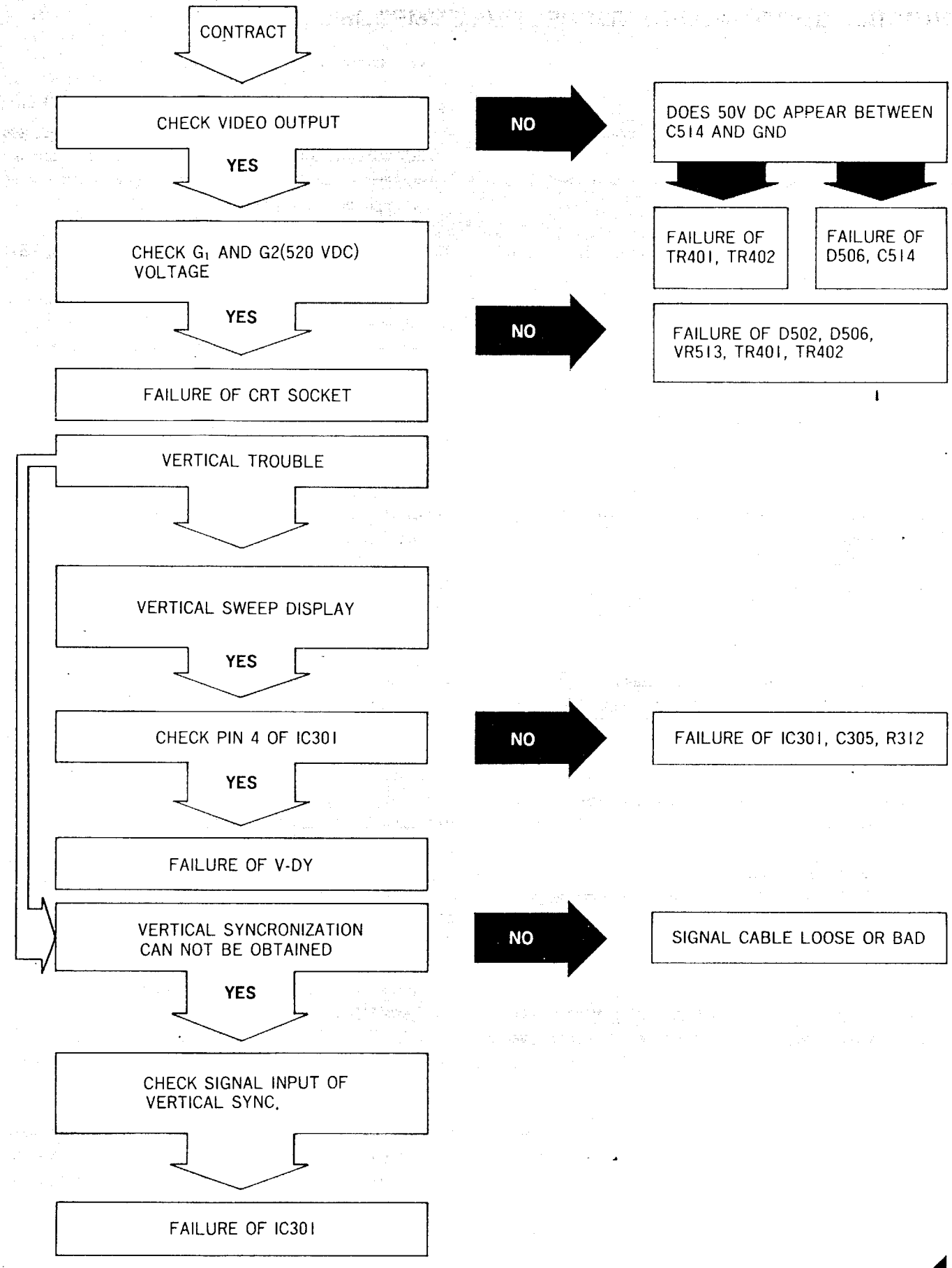


WHEN SIGNALS OTHERS THEN THE RECOMMENDED SIGNAL ARE RECEIVED

PHENOMENON	CAUSE	PHENOMENON	CAUSE
Picture width too wide. 	Data display period is more than 45μ sec.	Height of picture too much extended. 	Vertical flyback period is less than 1.058ms
Picture width too narrow. 	Data display period is less than 45μ sec.	picture deviates up ward. 	Picture until that vertical sync signal period or more.
Picture deviates to the right 	Value of front porch is more than 0.55μ sec or value of back porch is less than 0.55μ sec.	Picture deviates down ward. 	Picture until that vertical sync signal period or less.
Picture deviates to the left. 	Value of front porch is less than 0.55μ s, or value of back porch is more than 0.55μ sec.	Picture becomes lateral stripes. 	Horizontal sync. frequency is not set to 18.43KHz
Height of picture too shortened. 	Vertical flyback period is more than 1.058ms	Picture flows vertically (upward and down ward) 	Vertical sync. frequency is not set to 50Hz

TROUBLE SHOOTING INFORMATION CHART




CONTRACT
CHECK VIDEO OUTPUT
NO
DOES 50V DC APPEAR BETWEEN C514 AND GND
YES
FAILURE OF TR401, TR402
FAILURE OF D506, C514
CHECK G1 AND G2(520 VDC) VOLTAGE
YES
NO
FAILURE OF D502, D506, VR513, TR401, TR402
FAILURE OF CRT SOCKET
VERTICAL TROUBLE
VERTICAL SWEEP DISPLAY
YES
CHECK PIN 4 OF IC301
NO
FAILURE OF IC301, C305, R312
YES
FAILURE OF V-DY
VERTICAL SYNCRONIZATION CAN NOT BE OBTAINED
NO
SIGNAL CABLE LOOSE OR BAD
YES
CHECK SIGNAL INPUT OF VERTICAL SYNC.
FAILURE OF IC301

TROUBLE SHOOTING FOR RESPECTIVE SYMPTOMS

▼ NO RASTER

1) Turn the internal brightness control clockwise fully :
If raster appears : Good
If raster does not appear : No good to next check item.

2) Is CRT heater on?
It is not on : Check CRT-Heater voltage, power supply circuit and CRT socket for normality.
It is On : Proceed to next check item.

3) Check high voltage by high-voltage voltmeter.
High voltage is not obtained.
Check of flyback transformer T501.
Check the collector pulse of TR502, base pulse of TR502.
High voltage is obtained : to next check item.

- Check respective CRT electrode voltage for normality with a multi-tester.
  G1 : 100V-100V
  G2 : 500V-600V
  G4 : 0V-400V
  K : 40V-55V

  When voltage of G_1 and G_4 are not obtained :
  Check of D502, D503, D504, D505 and T501, wire breakdown.

  Voltage of G_1 is not obtained :
  Check of D505, D506, VR503 (EXT. BRT.), Wire breakdown.

  Voltage of K is not obtained :
  Check of D504, TR401, TR402, Wire breakdown.

  Voltage of G_2, G_4 and K are normal :
  CRT is faulty, replace CRT.

- Only one raster line appears in horizontal direction : Check of deflection yoke vertical coil. When deflection yoke vertical coil is shorted or opened, deflection yoke is faulty and should be replaced.

- Only one raster line appears in vertical direction : Check for wire broken in deflection yoke horizontal coil, width coil, linearity coil are open and TR502 is short or open.

- Raster is deformed abnormally : Rare shorting of deflection yoke coil replace deflection yoke.

- Excessive noise in raster :
  Check by measurement that ripples of power supply is less than 50mV p-p when ripples are normal, check to determine whether is any such source that causes alternating magnetic field near the unit.

- When power is turned off spot remains : Check C402, C511 and CRT for deterioration.

- Brightness range is abnormal :
  Deterioration of C511, or CRT, check of G_2 voltage, check of heater voltage.
  Check of TR401, TR402 and E401 and C515.

- Raster size is small and picture is abnormally bright (high voltage is abnormally high) check of C506 or FBT.

- Vertical synchronization is not achieved.
  Check of IC301, VR302.

- Raster position is deviate to CRT face :
  Turn deflection yoke centering magnet so that raster should be positioned at center.

- Picture or characters do not appear, contrast is unachievable :
  Check of pin 8 of IC201 and associated components.
  Check of input signal.
  Check of CRT.

- Picture or characters are displayed but inclined :
  Untighten clamp screw on deflection yoke rectify the inclination by turning the entire deflection yoke.

- Fine lines(noise) appear in the picture and characters shiver :
  Check high-voltage portion for leakage.
  Check connectors for complete contact.
  Check FBT for wire breakdown.

- It takes long for picture to appear (more than 15 seconds) service life of CRT has reached replace CRT.

- Sync noise not replated with input data appears in picture :
  Check grounding wire for poor contact video grounding for incompleteness input signal for normality and power supply return for incompleteness.

- Picture appear and disappear alternately :
  Check of input signal.
  Check of video circuit for poor soldering.
  Check of CRT socket.

- Horizontal linearity is not achieved :
  Check of L502, C507, TR502.

- Vertical linearity is not achieved :
  Check of IC301, VR301.

- Focusing is not achievable :
  Check of voltage G_2 and G_4. Readjustment of VR502.
  Check of high voltage.
  Check of D502.

  When all above items are normal, CRT is faulty and should be replaced.

VOLTAGE CHART

1. TRANSISTOR

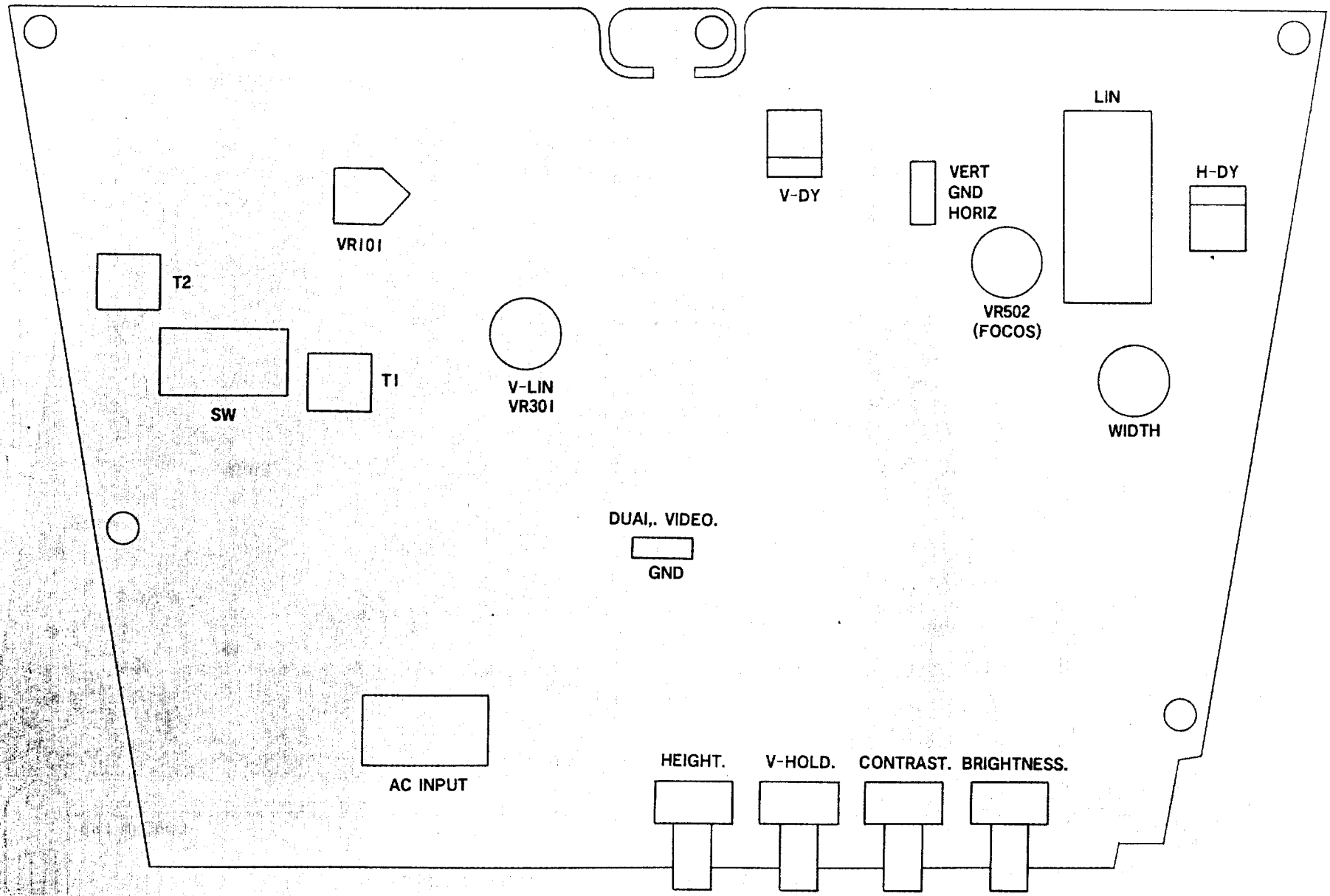
Measured with high impedance V.T.V.M or circuit tester under line voltage 120V, voltage reading may very ±10%

TR Lo/No.	TR Type	Function	Operating Condition	Base	Emitter	Collector	Note on Measurement
TR101	MJE-3055	Voltage Regulator	No signal 4.5V p-p Signal	- 8V	- 7.4V	0.0V	V.T.V.M
TR102	A1015 A733V	Voltage Regulator	No signal 4.5V p-p Signal	7.01V	6.8V	- 7.06V	〃
TR401	C2310	Video AMP Output	No signal 4.5V p-p Signal	6.97V 6.89V	6.56V 6.55V	14.52V 44.2V	〃
TR402	C1815	Video Drive	No signal 4.5V p-p Signal	0.31V 1 V	2.8nV 0.6 V	6.06V 6.6 V	〃
TR501	C1008	Horizontal Drive	No Signal 4.5V p-p Signal	0.2mV 0.24V	1.6mV 6.7mV	15.36V 7.1 V	〃
TR502	BU806	Horizontal Output	No signal 4.5V p-p Signal	1.2mV 51 mV	1.4mV 19.8mV	14.97V 19.74V	〃

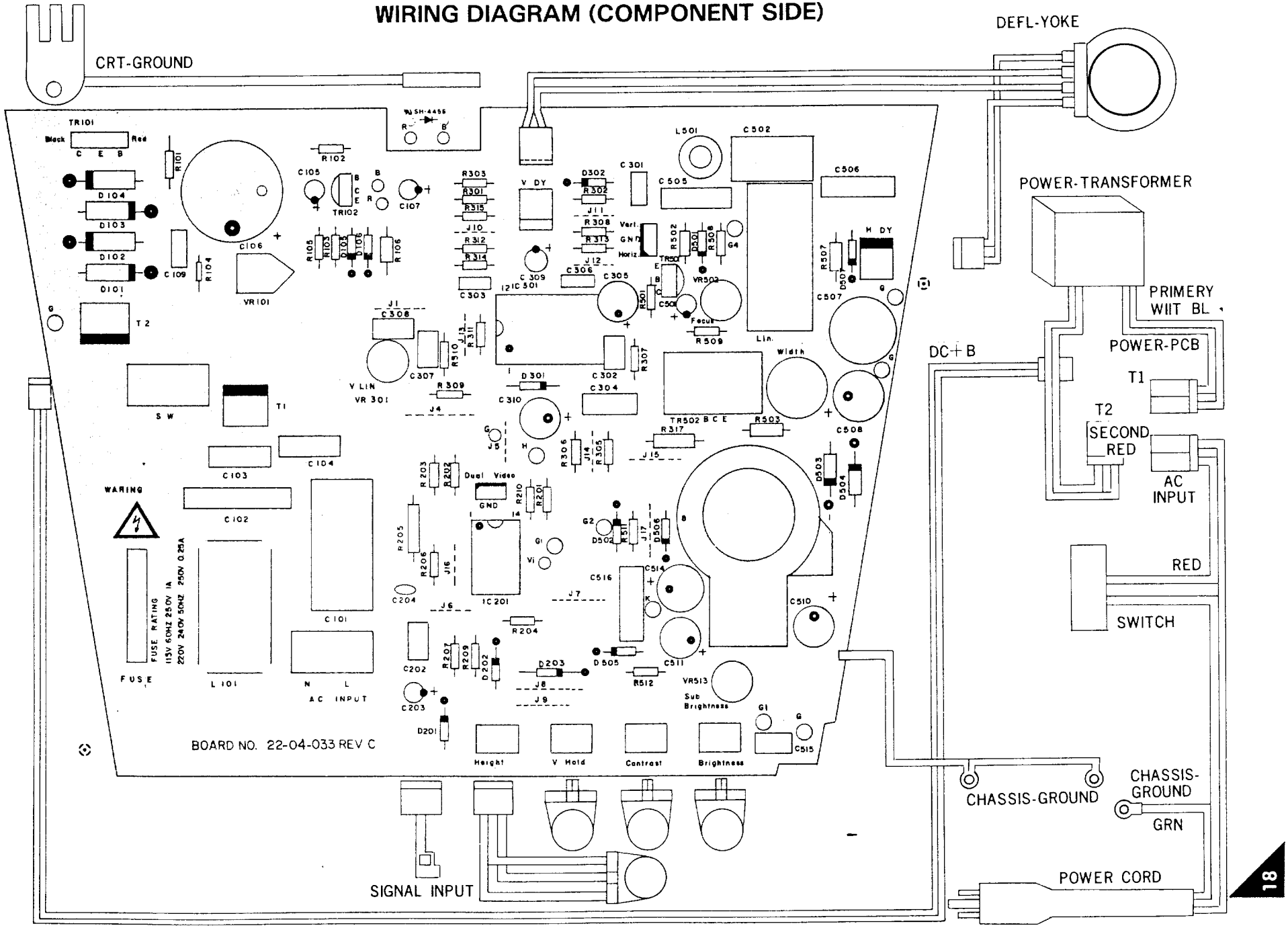
2. IC

Pin No	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC201 74LS06 VIDEO DRIVE														
No Signal	189 mV	5 V	5 V	187 mV	2.6 mV	2.6 mV	2.6 mV	0.32 V	5.04 V	5.04 V	190 mV	2 mV	2.1 mV	5 V
4.5Vp-p Signal	0.2 V	5 V	5 V	191 mV	5 mV	5 mV	5 mV	1.02 V	3.7 V	3.7 V	0.78 V	4.5 mV	4.5 mV	5 V
IC301 TDA 1170N VERTICAL OSC/PRIVER OUTPUT														
No Signal	5.2 V	15.36 V	85 V	8.2 V	14.85 V	6.64 V	6.74 V	1.63 V	3.12 V	2.1 V	0.695 V	4.6 V		
4.5Vp-p Signal	4.8 V	15.2 y	102 mV	8.4 V	14.7 V	6.65 V	6.75 V	4.73 mV	2.9 V	2 V	0.7 V	4.2 V		

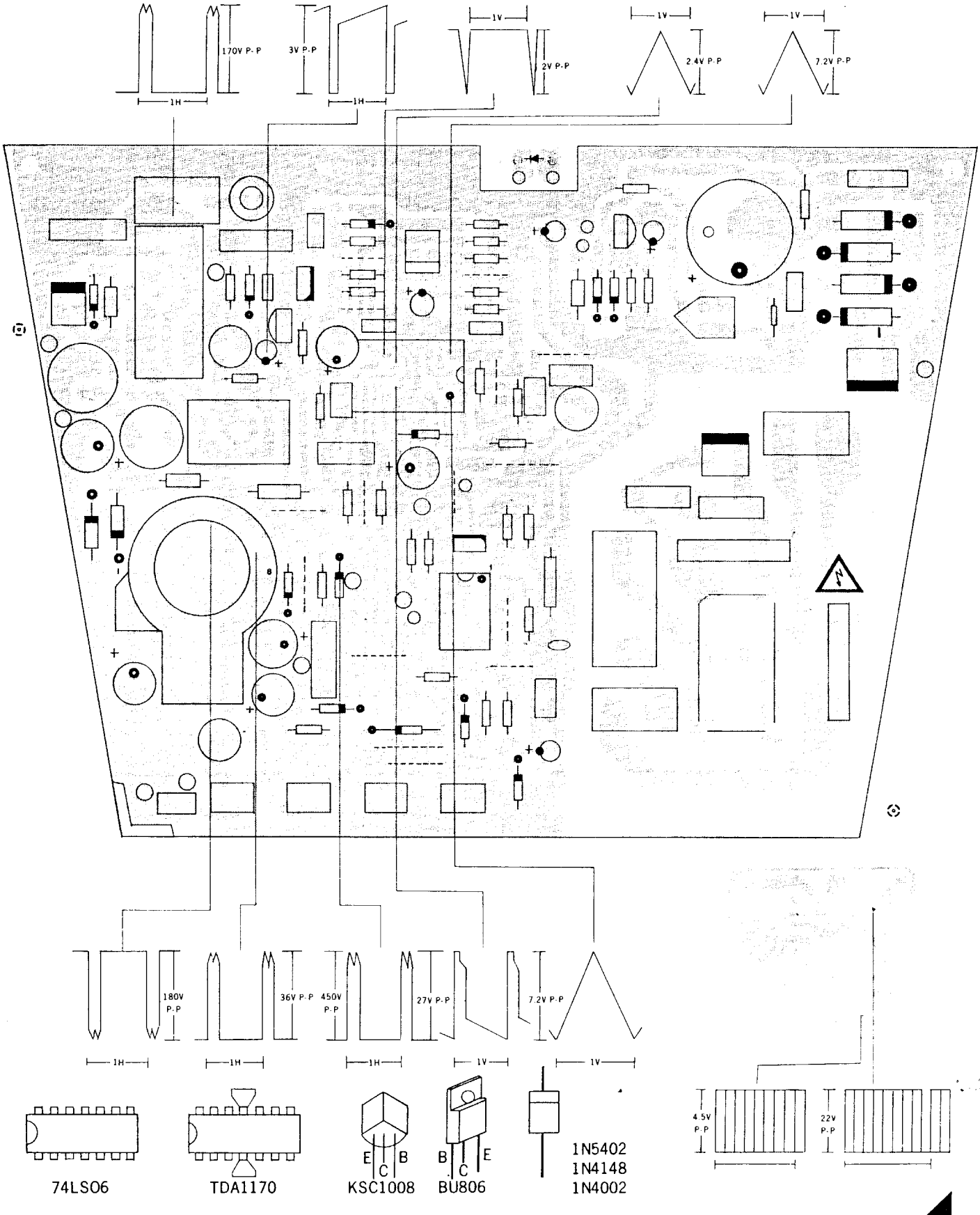
ADJUSTER AND CONNECTOR FOR MAIN PC BOARD.



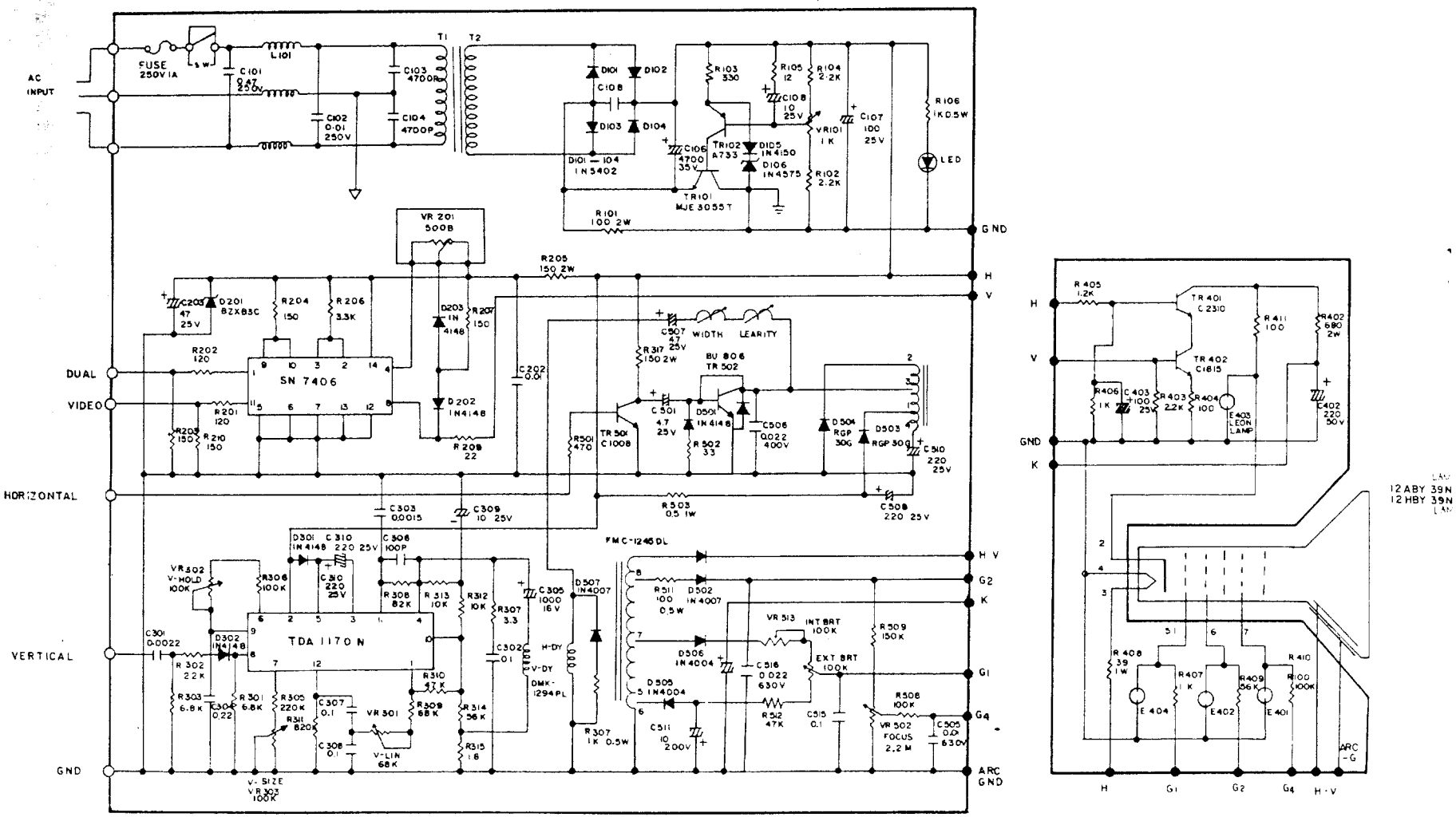
WIRING DIAGRAM (COMPONENT SIDE)



PC BOARD ASSEMBLY (SOLDER SIDE)



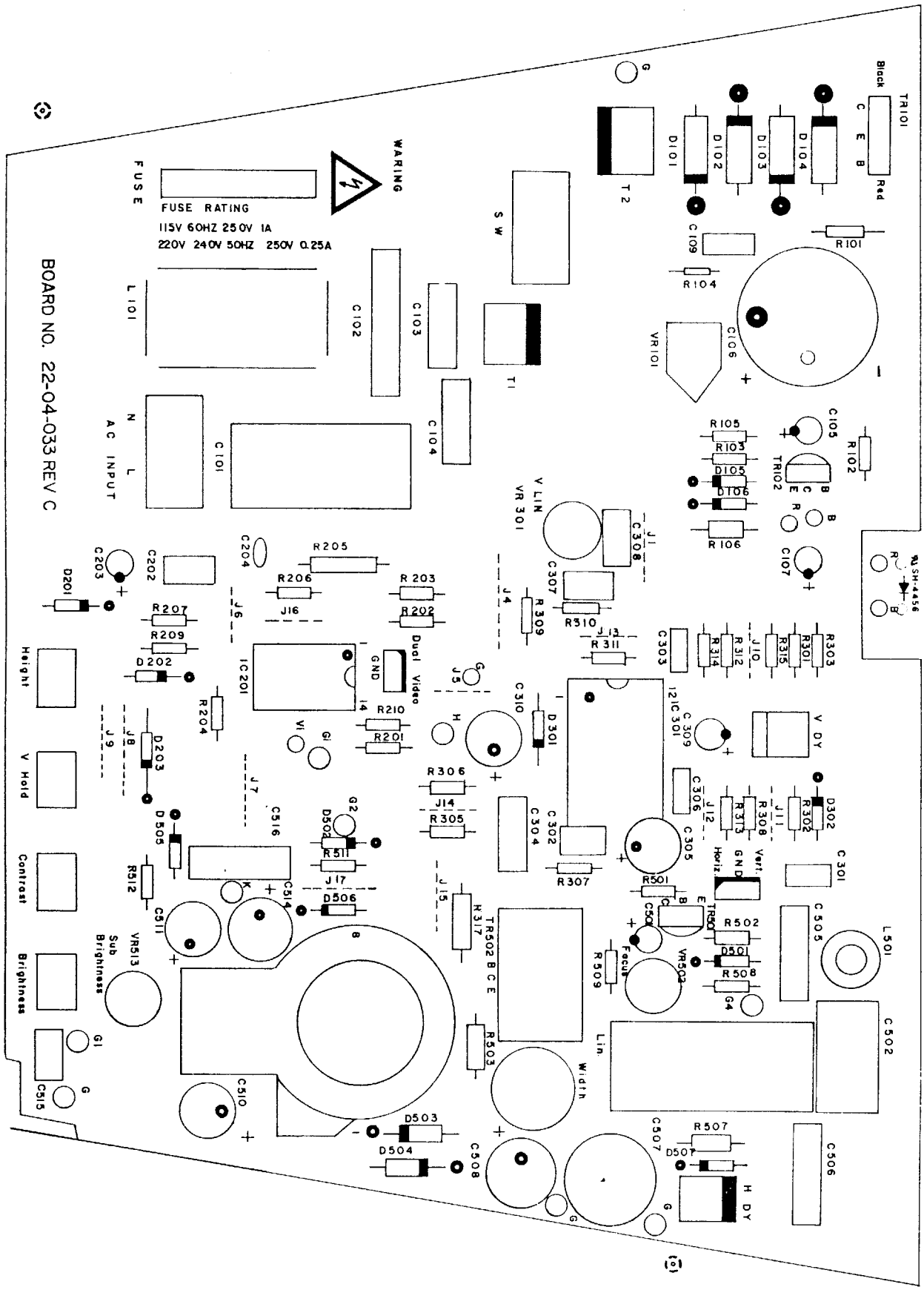
SCHEMATIC DIAGRAM



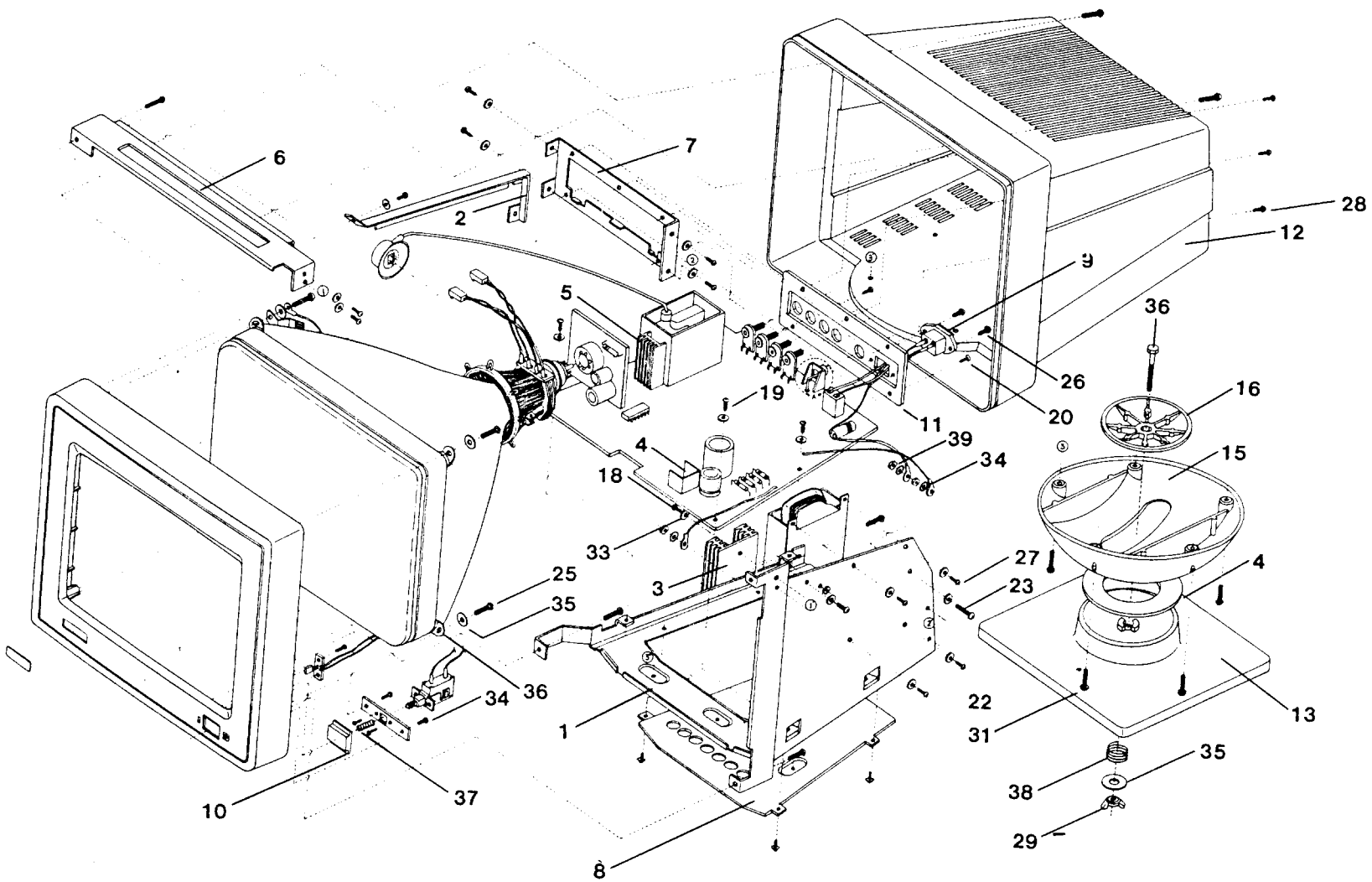
NOTES. UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTORS ARE IN OHM 0.25W.
2. ALL CAPACITORS ARE IN uF 100V.
3. ○ DENOTES HOUSING CONNECTOR.
4. ● DIRECT.

PCB COMPONENT LOCATION



EXPLODED VIEW



REFER TO PAGE : 25~26

REPLACEMENT PARTS LIST

Location No.	Part No.	Description
	PICTURE TUBE	
	26-04-013	Picture Tube(Type : 12HBY39N)
	INTEGRATED CIRCUITS	
IC201	20-01-014	SN7400,74LS06
IC301	20-06-002	TDA 1170N
	TRANSISTORS	
TR101	18-07-019	MJE-3055T
TR102	18-05-002	A1015,A733V
TR501	18-04-004	KSC 1008
	DIODES	
D101	19-01-007	Diode,1N5402
D102	19-01-007	Diode,1N5402
D103	19-01-007	Diode,1N5402
D104	19-01-007	Diode,1N5402
D105	19-03-004	Diode,1N4148
D106	19-05-024	Zener,BZX 83C 6V2
D201	19-05-015	Zener,BZX 83C 5V1
D202	19-03-004	Diode,1N4148
D203	19-03-004	Diode,1N4148
D301	19-03-004	Diode,1N4148
D302	19-03-004	Diode,1N4148
D501	19-03-004	Diode,1N4148
D502	19-01-006	Diode,1N4007
D503	19-01-023	RGP 30G
D504	19-01-023	RGP 30G
D505	19-01-004	Diode,1N4004
D506	19-01-004	Diode,1N4004
D507	19-01-006	Diode,1N4007
	CAPACITORS	
C101	16-25-005	Capacitor-FXD M-Polypropylene 0.47uF AC250V (115V Only)
Alternate	16-18-005	Capacitor-FXD M-Paper 0.47uF AC 250V (230V Only)
C102	16-25-006	Capacitor-FXD M-Polypropylene 0.01uF AC 300V (115V Only)
Alternate	16-18-003	Capacitor-FXD M-Paper 0.01uF AC 250V (230V Only)
C103	16-25-010	Capacitor-FXD M-Polyplopylene 4700pF AC 300V (115V Only)
Alternate	16-18-002	Capacitor-FXD M-Paper 4700pF AC 250V (230V Only)
C104	16-24-810	Capacitor-FXD M-Polyplopylene 4700pF AC 300V (115V Only)
Alternate	16-18-002	Capacitor-FXD M-Paper 4700pF AC 250V (230V Only)
C105	16-04-004	Capacitor-FXD Electrolytic 10uF 25V
C106	16-01-028	Capacitor-FXD Electrolytic 3300uF 35V (115V Only)
Alternate	16-01-030	Capacitor-FXD Electrolytic 6800uF 35V (230V Only)
C107	16-04-007	Capacitor-FXD Electrolytic 100uF 25V
C109	16-19-017	Capacitor-FXD Ceramic 0.01uF 50V
C202	16-14-011	Capacitor-FXD Mylar 0.01uF 50V
C203	16-14-006	Capacitor-FXD Electrolytic 47uF 25V
C301	16-14-009	Capacitor-FXD Mylar 0.0022uF 50V
C302	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C303	16-14-001	Capacitor-FXD Mylar 0.0015uF 50V
C304	16-13-016	Capacitor-FXD Mylar 0.22uF 100V
C305	16-01-011	Capacitor-FXD Electrolytic 1000uF 16V
C306	16-11-002	Capacitor-FXD Ceramic 100pF 50V
C307	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C308	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C309	16-14-004	Capacitor-FXD Electrolytic 10uF 25V
C310	16-01-021	Capacitor-FXD Electrolytic 220uF 25V
C501	16-04-003	Capacitor-FXD Electrolytic 4.7uF 25V
C505	16-15-008	Capacitor-FXD Polypropylene 0.01uF 630V
C506	16-15-006	Capacitor-FXD Polypropylene 0.022uF 400V
C507	16-09-006	Capacitor-FXD N-Polar 4.7uF 25V
C508	16-01-021	Capacitor-FXD Electrolytic 220V 25V
C510	16-01-021	Capacitor-FXD Electrolytic 220uF 25V
C511	16-01-073	Capacitor-FXD Electrolytic 10uF 200V
C514	16-01-079	Capacitor-FXD Electrolytic 47uF 100V
C515	16-14-008	Capacitor-FXD Mylar 0.1uF 100V
C516	16-15-009	Capacitor-FXD Polypropylene 0.022uF 630V

PESISTORS

R101	14-10-101	Resistor-FXD Carbon 100Ω 2W 5%
R102	14-04-182	Resistor-FXD Carbon 1.8KΩ 1/4W 5%
R103	14-04-331	Resistor-FXD Carbon 330Ω 1/4W 5%
R104	14-04-222	Resistor-FXD Carbon 2.2KΩ 1/4W 5%
R105	14-04-120	Resistor-FXD Carbon 12Ω 1/4W 5%
R106	14-10-102	Resistor-FXD Carbon 1KΩ 1/4W 5%
R201	14-04-121	Resistor-FXD Carbon 120Ω 1/4W 5%
R202	14-04-121	Resistor-FXD Carbon 120Ω 1/4W 5%
R203	14-04-151	Resistor-FXD Carbon 150Ω 1/4W 5%
R204	14-04-151	Resistor-FXD Carbon 150Ω 1/4W 5%
R205	14-10-151	Resistor-FXD Metal Oxide 150Ω 2W 5%
R206	14-04-332	Resistor-FXD Carbon 3.3KΩ 1/4W 5%
R207	14-04-151	Resistor-FXD Carbon 150Ω 1/4W 5%
R209	14-04-470	Resistor-FXD Carbon 47 KΩ 1/4W 5%
R210	14-04-151	Resistor-FXD Carbon 150Ω 1/4W 5%
R301	14-04-682	Resistor-FXD Carbon 6.8KΩ 1/4W 5%
R302	14-04-222	Resistor-FXD Carbon 2.2KΩ 1/4W 5%
R303	14-04-682	Resistor-FXD Carbon 6.8KΩ 1/4W 5%
R305	14-04-224	Resistor-FXD Carbon 220KΩ 1/4W 5%
R306	14-04-104	Resistor-FXD Carbon 100KΩ 1/4W 5%
R307	14-04-033	Resistor-FXD Carbon 3.3Ω 1/4W 5%
R308	14-04-823	Resistor-FXD Carbon 82KΩ 1/4W 5%
R309	14-04-683	Resistor-FXD Carbon 68KΩ 1/4W 5%
R310	14-04-473	Resistor-FXD Carbon 47KΩ 1/4W 5%
R311	14-09-824	Resistor-FXD Carbon 820KΩ 1/4W 5%
R312	14-10-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R313	14-10-103	Resistor-FXD Carbon 10KΩ 1/4W 5%
R314	14-04-562	Resistor-FXD Carbon 5.6KΩ 1/4W 5%
R315	14-04-018	Resistor-FXD Carbon 1.8Ω 1/4W 5%
R317	14-10-151	Resistor-FXD Metal Oxide 150Ω 2W 5%
R501	14-04-471	Resistor-FXD Carbon 470Ω 1/4W 5%
R502	14-04-330	Resistor-FXD Carbon 33Ω 1/4W 5%
R503	14-09-005	Resistor-FXD Metal Oxide 0.5Ω 1W 5%
R507	14-06-102	Resistor-FXD Carbon 1KΩ 1/2W 5%
R508	14-04-104	Resistor-FXD Carbon 100KΩ 1/4W 5%
R509	14-04-154	Resistor-FXD Carbon 150KΩ 1/4W 5%
R511	14-06-101	Resistor-FXD Carbon 100Ω 1/2W 5%
R512	14-04-473	Resistor-FXD Carbon 47KΩ 1/4W 5%

CONTROLS

VR101	15-02-024	V-Trimer W/Shaft 1KΩ B0.1W 25%
VR201	15-03-008	H-Trimer W/Shaft 500Ω B0.2W 25%
VR301	15-05-013	V-Trimer W/Shaft 68KΩ B0.15W 25%
VR302	15-03-003	H-Trimer W/Shaft 100KΩ B0.2W 25%
VR303	15-03-003	H-Trimer W/Shaft 100KΩ B0.2W 25%
VR502	15-05-010	H-Trimer W/Shaft 2.2MΩ B0.15W 25%
VR503	15-03-003	H-Trimer W/Shaft 100KΩ B0.2W 25%
VR513	15-05-007	V-Trimer W/Shaft 100KΩ B0.15W 25%

TRANSFORMERS & FUSE & FUSE CLIP

T1	17-01-034	Power Transformer 451-01-027 (115V Only)
T1	17-01-035 049	Power Transformer 451-01-028 (230V Only)
1	23-01-028	Fuse 1A/250V
	23-04-003	Fuse Clip 5ϕ (95mm)

COILS

L503	17-04-014	H-Width (403-01-014)
L502	17-05-010	H-Lin (404-01-010)
	17-08-005	Line Filter 457-01-004 (230V Only)

FLYBACK TRANSFOMER

T501	17-02-020	FBT (FMC-1245DL)

AC CORDS & TERMINARS & WIRINGS

00-07-019	Signal Cable, 1400mm (115V Only)
00-07-008	Siglal Cable 1200mm (230V Only)
21-07-004	Power Cord SVT 3/18 AWG 6F Black (115V Only)
21-07-005	Power Cord SVT 3/18 AWG 6F Black (230V Only)
10-11-028	HDR, Shrouded, 2.5, 3P, Y (Signal Input Base)
10-11-001	HDR, Lock, 3.96, 2P, BL (V-DY Base)
10-11-002	HDR, Lock, 3.96, 2P, N (H-DY Base)

10-11-005	HDR, Lock, 7.92, 2P (Transformer)
21-05-004	Wire, Connector Housing, 2.5, 3P, 140mm (TR 101 Connector)

WIRINGS

21-03-035	Wire, Bus SPA AWM 0.6
21-01-014	Wire Stranded, AWG 1015/#22 45mm Black
21-06-016	Wire Ring TER ϕ5D 100mm Black

MISCELLANEOUS

06-21-033	Signal Cord Ground Clip
10-05-017	Strain Relife
06-23-003	Lug Ground, 66.0×18.1×0.35
13-16-013	Manual
06-26-003	Logo
13-15-094	Label Product FST (115V Only)
13-15-095	Label Product FST (230V Only)
07-21-002	Magnet Square, Ferrite 10 Gauss etc.
07-22-012	Ring Core B-1500
12-21-003	Tube Shrinkable ϕ 5X20
13-13-019	Styroform, Left
13-13-020	Styroform, Right
13-11-048	C/T Box

BU 806 ASS'Y

00-06-013	Ass'y 006 Heat Sink BU 806
18-07-013	TR,NPN BU 806
06-25-006	Heat Sink, AL, BL 23.2×13.8×50
24-42-001	Washer Gear Out Side 3.2×6.5×0.45W
24-01-003	M-Scr Pan Head M3×8W

BACK PLATE ASS'Y

00-09-011	Ass'y AC Recept
10-05-056	Back Plate 1380 C
10-08-003	Socket AC Receptable 3505
07-22-012	Ring Core B-1500
12-21-003	Tube, Shrinkable W,ϕ 5×20
24-26-012	P-SCR C/S Head BL, 4×12

DEFLECTION YOKE ASS'Y

00-02-026	Ass'y Deflection Yoke
17-03-017	Deflection Yoke DMK-1294DL
21-02-091	Wire Conn, Housing 3.96, 2P BL 180mm
21-05-092	Wire Conn, Housing 3.96, 2P N 190mm

INLET SOCKET ASS'Y

00-09-010	Ass'y AC Recept
10-08-003	Socket AC Receptable 3505
21-05-095	Wire Conn Housing 3.96, 2P. GR W,BL 55mm
12-21-003	Tube, Shrinkable 5ϕ

POWER SWITCH ASS'Y

00-04-017	Ass'y Power S/W
23-02-010	Switch Power
21-05-093	Wire Conn Housing, 3.96,2P,N Red 180mm
06-21-017	Plate For S/W
24-02-001	M-Screw Pan Head W/Washer M3×5W

MECHANICAL PARTS

06-20-007	Chassis Bottom ····· 1
06-20-032	Chassis Brace Support ····· 2
06-25-023	Heat Sink, Regulator 50×14×60 ····· 3
06-25-011	Heat Sink. IC TDA1170 21.3×23.0×0.3 ····· 4
06-22-019	BRKT Attachment ····· 5
06-21-014	Plate Back ····· 6
06-24-006	Shield Bottom ····· 7
10-04-003	Inlet Socket ····· 8

	10-05-051	Knob S/W 1380C ····9
	10-05-053	Rear Cover 1380C ····10
	10-05-052	Stand 1380C ····11
	10-05-049	Stand/Part ····12
	10-05-054	Neck 1380C ····13
	10-05-048	Neck/Part ····14
	24-01-003	M-Screw Pan Head M3×8W ····15
	24-26-037	M-Screw.Pan Head W/Washer C M3×8W ····16
	24-26-001	M-Screw C/S Head C M3×8W ····17
	24-26-007	T-Screw Pan Head M3×5W ····18
	24-01-010	M-Screw Pan Head M4×15W ····19
	24-26-039	P-Screw Pan Head W/Washer M4×10W ····20
	24-04-005	P-Screw Pan Head #6×10W ····21
	24-04-014	P-Screw Pan Head #8×15W ····22
	24-26-012	P-Screw C/S Head #4×12 Black ····23
	24-26-019	T-Screw Hex Head W/Washer M4×8W ····24
	24-26-025	M-Screw Pan Head M3×10 Platinum ····25
	24-33-002	Nut Butterfly M5×0.8P W ····26
	24-03-006	M-Screw Hex Head M5×40W ····27
	24-26-027	M-Screw Pan Head Cone Type M4×13.5W ····28
	24-42-001	Washer Gear Out Side 3.2×6.5×0.45 W ····29
	24-42-007	Washer Gear Out Side 4.8×9.5×0.5 W ····30
	24-41-017	Washer Flat 5.3×16×1.2W ····31
	10-09-007	Rubber Washer 5×14×2 ····32
	24-45-001	Spring Compression 9×21×0.5Y ····33
	24-45-002	Spring Compression 23×17×2Y ····34
	24-31-005	Nut Hex M4×0.7P W ····35

CRT SOCKET ASSEMBLY

	10-08-016	Socket CRT 20 ϕ 6 Pin
	22-04-035	P.C Board FR-1, Socket 1.6t

TRANSISTORS

Q401	18-04-015	KSC 2310Y
Q402	18-04-006	C1815

LAMP&-SPARK-GAPS

E401	16-24-003	Spark-Gap 1KV −15% /+50%
E402	16-24-003	Spark-Gap 1KV −15% /+50%
E403	16-24-004	Neon Lamp 100V
E404	16-24-003	Spark-Gap 1KV −15% /+50%

WIRINGS

VI EI	21-01-037	Wire Coaxal Cable AWM1365 190mm Black
GI	21-01-002	Wire Strended AWM1007 215mm Brown
K	21-01-003	Wire Strended AWM1007 175mm Red
H	21-01-005	Wire Strended AWM1007 161mm Yellow
GND	21-01-014	Wire Strended AWM1015 196mm Black
G2	21-01-020	Wire Strended AWM1015 166mm Blue
G4	21-01-021	Wire Strended AWM1015 234mm Violet

CAPACITORS

C402	16-01-033	Capacitor-Fxd. Electrolytic 220uF 50V
C403	16-04-007	Capacitor-Fxd. Electrolytic 100uF 25V

RESISTORS

R402	14-10-681	Resistor-Fxd. Metal Oxide 680Ω 2W 5%
R403	14-04-101	Resistor-Fxd. Carbon 100Ω 1/4W 5%
R404	14-04-101	Resistor-Fxd. Carbon 100Ω 1/4W 5%
R405	14-04-112	Resistor-Fxd. Carbon 1.2KΩ 1/4W 5%
R406	14-04-102	Resistor-Fxd. Carbon 1KΩ 1/4W 5%
R407	14-04-102	Resistor-Fxd. Carbon 1KΩ 1/4W 5%
R408	14-09-390	Resistor-Fxd. Metal Oxide 39Ω 1W 5%
R409	14-04-563	Resistor-Fxd. Carbon 56KΩ 1/4W 5%
R410	14-04-104	Resistor-Fxd. Carbon 100KΩ 1/4W 5%
R411	14-04-222	Resistor-Fxd. Carbon 2.2KΩ 1/4W 5%
R412	21-01-035	Wire,BUS.SPA AWM 0.6 52mm